than 100 km., and the intensity of the sound at this least distance is not less than near the boundary of the inner sound-area.

Dr. van Everdingen refers to several dynamite and volcanic explosions which have been carefully studied from 1903 to 1911. He also adds some interesting observations made chiefly in Holland during the present war. The most important case is that of the bombardment of Antwerp on October 8, 1914. The reports were heard at many places in Holland within 100 km. from the source and again outside a circle of 158 km. radius, but at very few intermediate places. The silent region is bounded by two curves, which are roughly circular, the inner arc being traced for more than 180° and the outer for more than 90°. In some cases of heavy firing at later dates there are also indications of silent regions; in others an increased audibility has been established near the line of 160 km. In no case is there any certain indication of any asymmetrical propagation of the sound.[2]

Dr. van Everdingen examines the two explanations which have been offered of the existence of the silent region, one of which relies on variations of wind-velocity and temperature with the altitude; the other (von dem Borne's) on changes in the composition of the atmosphere at great heights. On the former explanation we might expect asymmetry, on the latter symmetry, with regard to the source of sound. He considers that both explanations are true and should be applied in combination. In favour of the second explanation, he urges the facts that in recent cases the outer margin of the silent region has always been about 160 km. from the probable source of sound and that no appreciable deviations from the circular form have been observed. The above distance is greater than the limiting distance (114 km.) assigned by von dem Borne, but Dr. van Everdingen shows that it agrees well with estimates made on the supposition that the percentage of hydrogen in the upper atmosphere is much smaller than that assumed by von dem Borne.

There can be no doubt as to the value and interest of Dr. van Everdingen's investigations. It would seem desirable, however, to continue and extend them. Though the existence of silent regions may be regarded as established, many more negative records are required to prove the symmetry of the region with reference to the source of sound. It must be remembered that the deep sounds of these explosions may at great distances be below the lower limit of audibility of some observers. Moreover, the mean radius of the outer margin of the silent region is very far from being constant. In one of the earliest cases in which the silent region was noticed—that of the minute-guns fired during the funeral procession of Queen Victoria on February 1, 1901 (*Knowledge*, vol. xxiv., 1901, pp. 124–5)—the radius was about 80 km.

C. DAVISON.

AERONAUTICS AND THE WAR.[1]

(1) MR. LANCHESTER'S latest book, unlike his previous works on aerial flight, can be read with considerable interest and without any great effort. The preface, by Lieut.-General Sir David Henderson, at once arrests attention and has caused more comment than any other equally long section of the book. The summary of the present aeronautical position is so interesting that a quotation of considerable length is here given. General Henderson writes:—

> There are no experts in military aeronautics; there are experts in the various branches: in flying, in scientific research, in the design and construction of aeroplanes and engines, in military organisation and tactics. But as yet there is little opportunity for the expert in one branch to gain definite knowledge of the others except by hard personal experience; in every direction there is progress, in every section of work opinion is fluid. . . . Of all the fields in which work for the advancement of military aeronautics has been undertaken in this country, that of scientific research has, up to the present, produced the results that will probably be most enduring. . . . In the work of stating and solving the problems of aeronautics, Mr. Lanchester was one of the pioneers; he was bold enough to publish the results of his investigations at a time when flying had only just been proved possible; and he has reason now to be well satisfied with the quality of his early work.

The author himself, in his introductory note, rubs in the last point very vigorously.

Mr. Lanchester commences by describing the functions of an aeronautical arm, stating that reconnaissance is the main duty, in which aircraft are related to the older arms of the Service. The opposing and destruction of enemy aircraft are classed as secondary functions. The problem of the relative merits of aeroplane and dirigible is treated at some length. Attention is directed to the superior speed of the aeroplane (practically double that of the dirigible). The limit of size is practically reached for the dirigible, whereas the present-day aeroplane nowise defines the limit, in Mr. Lanchester's opinion. This seems scarcely consistent with his present views, for his recent article in *Engineering* expresses the opinion that large aeroplanes will be less efficient than smaller ones. Mr. Lanchester is doubtful whether fighting is a primary function of the dirigible, and thinks that bomb-dropping is altogether a misuse. He points to the vulnerability of the airship, stating that "even to-day the finest of Germany's fleet of Zeppelins would be absolutely at the mercy of a modern aeroplane in the hands of a man prepared to make his one and last sacrifice." Before proceeding to more general considerations he disposes of the dirigible as a part of the aeronautical service, pointing out that if this proves untrue his main conclusions will not be affected.

The question of the vulnerability of the aeroplane is next dealt with, the advantage of the small target area offered is pointed out, and the possibility of armouring for low-altitude flying discussed. The fact that an insufficiency of armour is worse than none is strongly insisted upon.

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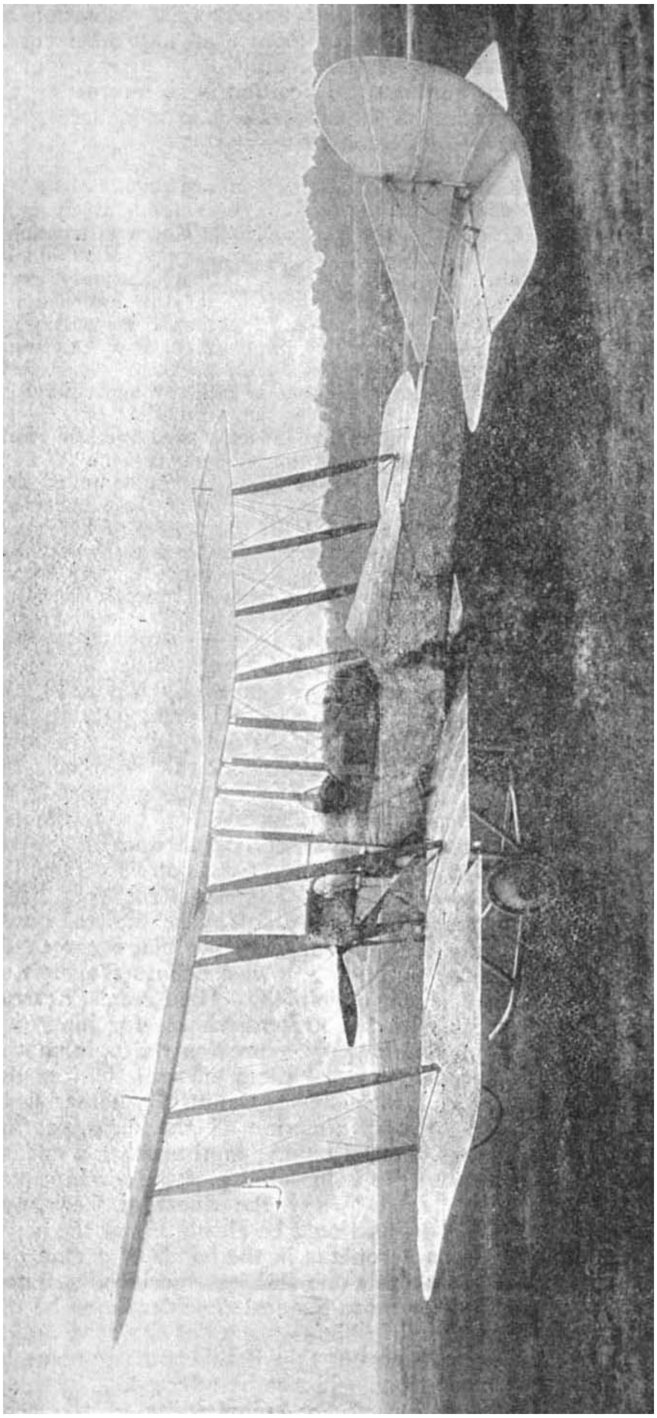
[2] It may be mentioned that, on October 28, 1914, the sound of the British naval guns that bombarded the Flemish coast was heard at a distance of 280 km., or 174 miles.

[1] (1) "Aircraft in Warfare: the Dawn of the Fourth Arm." By F. W. Lanchester. Pp. xviii + 222. (London: Constable and Co., Ltd., 1916.) Price 12*s*. 6*d*. net.
(2) "Aircraft in War and Peace." By W. A. Robson. Pp. xi + 176. (London: Macmillan and Co., Ltd., 1916.) Price 2*s*. 6*d*. net.



Early (experimental) model of B.E.2c. Calculated and demonstrated as inherently stable by the late Mr. E. T. Busk. From "Aircraft in Warfare."

Next follows a discussion of the principle of concentration, with numerous examples of the author's *n-square* law. This section does not call for much comment here.

Mr. Lanchester expresses the opinion that treaty restrictions framed for the other arms of the Service should not apply to the new arm, particularly pointing out that expanding bullets could be used with great effect in the destruction of the spars and struts of aeroplanes by gunfire. The question of the difficulty of aiming bombs is dealt with, and Mr. Lanchester thinks that the gun will eventually displace the bomb in the armament of aircraft.

The subject of naval aeronautics receives some attention, the great difference of the conditions from those of military aeronautics being specially remarked upon. The great value of aircraft for combating submarines is mentioned, and the question of the relative merits of seaplanes and aeroplanes carried by pontoon ships is discussed. It is stated that the pontoon ship offers better alighting facilities and enables faster machines to be used.

A great deal of space is devoted to the probable tactics of large fleets of aeroplanes. This subject gives Mr. Lanchester ample scope for his lively imagination, and his treatment of the subject is speculative in the extreme. It seems scarcely possible to define aeronautical tactics in such an extensive fashion at such an early stage in the development of the new arm.

Mr. Lanchester completes his book with a consideration of the present position, pointing out with no uncertain voice that the British aeroplane of to-day is better aerodynamically, more stable, more robust, and more weatherproof than the enemy's best machines, and in all ways better fitted for service conditions. It is stated that there was no good gun-carrying aeroplane in existence at the commencement of the war, and that the progress made has been astonishing. Reference is made to the work of the Royal Aircraft Factory, special praise being given to the full-scale experimental work of the late Mr. E. T. Busk. The scientific research work of the National Physical Laboratory receives consideration, and Mr. Lanchester reiterates that in scientific knowledge we are well ahead of all other nations. A board of aeronautical construction is advocated, as apart from the present advisory committee.

There is a brief appendix giving some details of the Lewis gun, the chief armament of our present military machines.

As General Henderson remarks at the close of his preface, Mr. Lanchester's book is well worth reading, and there is much in it worthy of study and reflection.

(2) The book by Mr. Robson can in no sense of the word be called a scientific work. It is a book for the "man in the street" who wishes to know a little about aircraft and about the organisation of our present-day air services. A great part of the discussion of the importance of the new aeronautical arm follows Mr. Lanchester's argument very closely, often in almost identical terms. There are many extravagant phrases in the book, as an example of which may be given the author's statement, in treating of the courage and resource of British airmen: "Germany could not wrest from us our ascendancy in the air even if she had ten times as many aeroplanes as we have." This is obvious exaggeration. Mr. Robson foresees the time, after peace is established, when aerial travel and transport will be the order of the day, and everyone of moderate means will possess his own private aeroplane. This seems to be going too far at the present stage of development, and only future experience can justify the prediction of such a brilliant future for aeronautics. The book can in no way be compared with Mr. Lanchester's work on the same subject, but it may prove useful to those who want a non-technical and popularly written outline of the present, and possible future, position of aeronautics in warfare.

E. F. R.

SIR GASTON MASPERO, K.C.M.G. (Hon.).

THE receipt of the news of the sudden death of Sir Gaston Maspero, whilst attending a meeting of the Académie des Inscriptions et Belles-Lettres in Paris on Friday, June 30, has been received with keen regret not only by Egyptologists, of whose science he was the ablest and most competent living exponent, but also by archæologists generally throughout the world. To his personal friends his death was not wholly unexpected, for during the last two years he suffered severely from acute illnesses at intervals, and his usually bright and cheery outlook on life was clouded by the bitter grief he felt at the loss of his nearest and dearest during the war. His brave spirit, however, clung to his work, and the last parts of the *Annales du Service* and *Recueil de Travaux* prove by his contributions to them that his great mental faculties and powers of work remained in effective condition to the end.

Maspero was born in Paris on June 23, 1846, and his family appears to have been of Italian origin. Little is known of his early years, but whilst still a boy he devoted himself to the study of Egyptology as expounded in the works of Chabas and de Rougé. His first important publication was a copy of the hieratic text of an Egyptian hymn to the Nile, edited from papyri in the British Museum, and accompanied by a French translation; it appeared in Paris in 1868, when he was about twenty-two years old. He was greatly encouraged in his work by Mariette, who in 1854 had been commissioned by Saîd Pâshâ to found a museum of Egyptian antiquities at Bûlâk. In 1873 Maspero took the degree of Docteur-ès-Lettres, and soon after succeeded de Rougé as professor of the Collège de France. In 1878 Mariette proposed to the French Government to found an archæological mission, and, on the proposal being accepted, Mariette succeeded in obtaining the appointment of director for Maspero, who took up his duties in Cairo in 1880.

In the following year (January 17, 1881) Mariette died, and Maspero became director of the Bûlâk Museum. In a very short time he arranged the objects in the museum on a definite system, and the catalogue of them which he published formed a most valuable compendium of Egyptian archæology. That the book may still be read with pleasure and advantage is a great testimony to the literary skill and knowledge of its writer. Having arranged the museum, Maspero devoted himself to developing, throughout the country, the system of excavations which Mariette had begun, and to the completion of Mariette's unfinished editions of papyri, etc. The discovery of the royal mummies and of the necropolis of Panopolis, and the clearing of the royal pyramids at Sakkârah and of the Temple of Luxor are evidences of the activity of Maspero during the first period of his rule at Bûlâk. In 1886, for private reasons, Maspero resigned his directorship at Bûlâk and returned to Paris, where he devoted several of the best years of his life to the compilation of his monumental "Histoire Ancienne des Peuples de l'Orient Classique," which appeared in three portly quarto volumes in 1895–99. A smaller work, bearing almost the same title, was published by him in 1875, and the number of editions through which it has passed attests its utility and popularity.

After Maspero's departure from Cairo in 1886 the management of the Egyptian museum fell into weak hands, and the scandal that attended the removal of the collections from Bûlâk to the Gizah Palace will not soon be forgotten by all who are interested in Egyptology. Matters went from bad to worse until British public opinion in Egypt demanded a change of director, and another Frenchman was brought to Egypt to preside over the Service des Antiquités. After two years it became evident that the scandals connected with the administration of the museum were increasing in frequency and magnitude, and at length Maspero was induced to return to Egypt and to resume the directorship of antiquities. This he did in 1899.

From 1899 to 1914 Maspero worked with a constancy and vigour which were marvellous. He directed and visited the excavations carried out by the Egyptian Government; he inspected the temples, and tombs, and other ancient buildings each year, spending some months in the process;